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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁴ : B30B 9/12, 9/14</p>	<p>A1</p>	<p>(11) International Publication Number: WO 87/ 05562 (43) International Publication Date: 24 September 1987 (24.09.87)</p>
<p>(21) International Application Number: PCT/AU87/00077 (22) International Filing Date: 18 March 1987 (18.03.87) (31) Priority Application Number: PH 5090 (32) Priority Date: 18 March 1986 (18.03.86) (33) Priority Country: AU (71) Applicant (for all designated States except US): AKT CONSULTANTS PTY. LIMITED [AU/AU]; Maroochy Industrial Estate, Cnr. Maroochy Road and Enterprise Street, Kunda Park, Buderim, QLD 4556 (AU). (72) Inventors; and (75) Inventors/Applicants (for US only) : RUIZ-AVILA, Jose, Luis [AU/AU]; Camp Flat Road, Bli Bli, QLD 4560 (AU). HOPPE, Dieter [AU/AU]; Eudlo Road, Mooloolah, QLD 4553 (AU).</p>		<p>(74) Agent: T.G. AHEARN & CO.; 79 Eagle Street, Brisbane, QLD 4000 (AU). (81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BG, BJ (OAPI patent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), DK, FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US. Published With international search report.</p>
<p>(54) Title: SEPARATOR</p> <p>(57) Abstract</p> <p>A separator for use in separating first and second physically different components from an input material, said separator (10) being located in a heatable passageway and including screw conveying means (14) which compresses the material in chamber (12) causing separation of the material, one component exits through perforated walls (13) into chamber (15) and exhausts through outlet (18). The remaining component descends into auxiliary conveyor screw chamber (20) for removal.</p>		

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1.

"SEPARATOR"

TECHNICAL FIELD OF THE INVENTION

THIS INVENTION relates to the separation of physically different components heat rendered from a first material. In particular the invention relates to apparatus for separation of fat, tallow, oil or water from materials such as solid proteinatous materials, for example meat, meal, gelatin, fish, bone and other organic materials containing useful proteinatous materials. The invention also has application to non-proteinatous materials such as fibrous organic materials.

BACKGROUND ART

In our Australian Patent Application No. 11,062/83 we disclose apparatus for the dehydration of organic material wherein the material to be dehydrated is agitated until it is partly comminuted and dried and passed into a dehydrating tower where final dehydration takes place. It is desirable that such apparatus have means for extraction of fat or tallow from the material prior to its passage to the agitating chamber. Whilst various fat extruding apparatus is known, such as apparatus which employs a perforated wall section against which the raw organic material is pressed, and which permits the passage of fat and low density proteinatous material therethrough, this type of apparatus is not suitable for all situations.

OUTLINE OF THE INVENTION

The present invention therefore aims to provide an improved fat or tallow extraction apparatus which in one embodiment may be suitably applied to the extraction of tallow from an organic material so that the resultant low fat content material may be subsequently dehydrated in a stream of heated air or gas for the production of a dehydrated meal such as fish meal or meal from various organic raw materials. The extraction apparatus of the

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separator for use in separating an input material into at least first and second physically different components, said components being rendered by subjecting said material to heat and pressure, said separator
5 including a conveyor means, said conveyor means being located adjacent a heat exchanger, said heat exchanger providing heat to pressurised material being conveyed, said conveyed material being rendered into said at least two components under the influence of said heat and said
10 pressure, said at least two components being subjected to a selective separator to substantially separate said components.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more
15 readily understood and put into practical effect, reference will now be made to the accompanying drawings wherein:-

Fig. 1 is a schematic view illustrating one embodiment of an apparatus according to the present
20 invention;

Figs. 2 and 3 are respective side and front views of a practical embodiment of extruder assembly according to the present invention;

Fig. 4 is a part sectional view of the
25 apparatus along the line A-A of Fig. 1;

Fig. 5 is a sectional view of the apparatus along the line B-B of Fig. 2;

Fig. 6 is a part sectional view of the apparatus along the line C-C of Fig. 2;

Fig. 7 is a partial plan view of the apparatus
30 according to the present invention;

Fig. 8 illustrates the extraction apparatus of the present invention supported in dehydration apparatus;

Fig. 9 is a schematic view illustrating
35 a further embodiment;

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Fig. 10 is a cross-sectional view through a portion of Fig. 9; and

Figs. 11 and 12 are elevation views illustrating further embodiments applicable to the present invention.

METHOD OF PERFORMANCE

Referring to the drawings and firstly to Fig. 1, there is illustrated a first embodiment of tallow extruder assembly 10 in accordance with the present invention including a hopper assembly 11 adapted to receive high fat content product or product from which the fat or tallow is to be separated and which leads into an elongated pipe or chamber 12 having perforated walls 13. Supported co-axially within the chamber 12 is a main auger or extruder screw 14 which when rotated is operative to feed the high fat content material along the chamber 12 as illustrated. The chamber 12 is supported co-axially within an outer housing 15 so as to define therebetween an annular space 16 for collection of extracted tallow. Suitably a scraper assembly 17 is located within the annular space and is operative to scrape tallow from the perforated walls 13 of the chamber 12 and direct the tallow downwardly to exit through an outlet 18 disposed at the lower end of the annular space 16.

An auxiliary auger assembly 19 is disposed in the housing 15 beneath the main auger 14 and is operative to convey low fat material outwardly of the housing 12. The auxiliary auger assembly 19 includes an outer hollow housing 20 having an inlet aperture 21 in a side wall so as to allow for the passage of low fat material therein, and an auger 22 which when rotated will convey the low fat material for discharge from the housing 15. In use, the high fat content material is loaded into the hopper 11 and is conveyed along the chamber 12 when the main auger 14 is rotated.

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The speed of rotation of the auxiliary auger 22 is selected to be such that output of low fat content product is less than input of high fat content product so that a back pressure results within the chamber 12 resulting in compression of the high fat content material. This pressing action will cause tallow (and water) to be forced through the perforated walls 13 of the inner chamber 12 into the annular space 16 to be thereby directed downwardly with the assistance of the scraper 17 and through the outlet 18 for collection. Low fat content material thus passes into the auxiliary auger assembly 19 to be directed outwardly of the housing for subsequent collection or further treatment. Where the main and auxiliary augers have the same pitch and diameter, the auxiliary auger 22 is rotated at a lower speed than the main auger 14 to generate the required back pressure. Of course if the auxiliary auger 22 has a smaller capacity than the main auger 14, back pressure will be generated if they are rotated at the same speed.

Whilst the auxiliary auger housing 20 is shown as inclined to the horizontal, it may be arranged horizontally or at the opposite inclination. The auxiliary auger assembly 19 may also be arranged parallel to the main auger 12.

In an alternative arrangement, the main auger may be located outside of the perforated wall so that extracted tallow is caused to pass inwardly into an internal pipe which may be provided with an internal scraper.

Heat may be applied to the housing 15 in any suitable manner to improve tallow separation if required.

Referring now to Figs. 1 to 8, there is illustrated a practical embodiment of the apparatus of the present invention.

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As shown in Fig. 8, the tallow extruder 10 of the present invention may be adapted to be suitably mounted within dehydration apparatus 23, for example dehydration apparatus of the type disclosed in our co-
5 pending Australian Patent Application No. 11,062/83. The extrusion apparatus 10 is suitably located in the hot air passageway 24 from the dehydrator burner 25 so that heat is applied thereto to assist in tallow extraction.

10 As shown, the outer housing 15 of the tallow extruder extends longitudinally of the hot air passageway 24 while the tallow outlet 18 preferably extends through a lower end of the passageway. The low fat content product is suitably directed by the auger
15 assembly 19 into the agitator 26 of the dehydrator, whereupon it passes into the dehydration tower 27.

The inner perforated pipe 12 (see Figs. 4 to 6) is located co-axially within the housing 15 and extends therealong to communicate at its upper end from
20 where it is supported with an inlet hopper 11 and be freely located at its lower end in an annular recess 28 in an end plate 29 suitably apertured at 30 to permit material to pass therethrough. The main auger 14 comprises in this embodiment a hollow shaft member 31
25 supported rotatably at its upper end on a bearing 32 which is itself supported by three radial arms 33 extending outwardly to the hopper 11. The shaft 31 is provided at its lower end with a spigot 34 which extends through the apertured plate 29 to be coupled by a bolt
30 35 to a hollow tube 36 which is an extension of a shaft 37 supported in bearings 38 at the lower end of the housing 15 and provided in this instance with a gear 39 to enable rotational motion to be transmitted to the shaft 31. The hollow shaft 31 carries helical flights
35 40 formed of a plate material which are adapted when the shaft 31 is rotated, to cause the material to progress

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downwardly within the perforated pipe. The bolted connection between the shaft extension 36 and spigot 34 allows, via a removable inspection port 41, easy detachment of the hollow shaft 31 and replacement of the auger where desired.

The hollow shaft extension 36 also supports for rotation, the apertured plate 29 upon which is mounted a plurality of circumferentially spaced upstanding members 42, in this instance four members, which are secured at their upper end to an annular member 43 upon which is mounted respective rollers 44 which engage with an annular bearing track 45 so as to enable free rotation of the ring 43 and thus members 42 upon rotation of the shaft 37 and thus apertured plate 29. A plurality of helical scraper members 46 extend between respective upstanding members 42 to serve to scrape the outer surface of the perforated pipe 12 and thereby clean adhering tallow material therefrom and direct that material downwardly to the tallow outlet 18.

Material passing through the apertured plate 29 is directed via an inclined member 47 into the inlet 21 of the auxiliary auger assembly 19 whereby it may be directed outwardly to the dehydrator agitator 26 and thence into the tower 27.

Many variations may be made to the practical embodiment of the apparatus illustrated in Figs. 2 to 7. For example as stated previously, the main auger may be located externally of the pipe 12 and arranged to press tallow therethrough into the interior thereof for subsequent discharge.

Many variations in scraper devices may be employed where required and in some instances, scrapers may be eliminated.

In combination with the dehydrating apparatus, heat is applied by virtue of the hot air generated by the burner, however, in other situations heat may be

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applied by steam or any other suitable medium or alternatively no heating medium may be employed so that the apparatus operates "cold".

Referring now to Fig. 9 there is illustrated a further embodiment of an apparatus 100 constructed in accordance with the present invention. The apparatus 100 is adapted for horizontal operation but may be operated vertically as is the case for the Fig. 1 embodiment. It will be realised that the Fig. 1 embodiment can be operated horizontally as well.

The apparatus 100 includes a hopper 111 adapted to receive high fat content product or product from which the tallow or fat is to be separated and which leads into an elongated pipe or chamber 112 having perforated walls 113. Supported co-axially within chamber 112 is a main auger or extruder screw 114 which when rotated is operative to feed high fat content material along the chamber 112 as illustrated by the arrows. The chamber 112 is supported co-axially within an outer housing 115 so as to define therebetween an annular space 116 for collection of extracted tallow. Suitably a scraper assembly 117 is located within the annular space and is operative to scrape tallow from the perforated walls 113 of the chamber 112 and direct the tallow downwardly to exit through an outlet 118 disposed at the lower end of the annular space 116.

An adjustable choke 119 is disposed in the housing 115 beneath the main auger 114 and is operative to provide a regulated back pressure to ensure that the rate at which material passes through the choke is less than the rate at which material passes through chamber 112. The cone shape choke 119 has three blades which are illustrated in Fig. 10, the blades are retained in their closed attitude by means of an interconnection with a wire rope going around and through the outer housing 115 to one or more tension springs 120.

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Alternatively hydraulic, electric or other control of the choke blades may be adopted. By adjusting the tension on springs 120 the pressure required to open blades 121 of the conical choke may be varied and therefore the back pressure may be varied in accordance with the spring tension. As material passes through the adjustable choke it is conveyed to the dehydrator by means of a paddle wheel 122, the paddle wheel being fixed to the main shaft 123.

Referring to Fig. 10, there is illustrated a cross-section through the choke region of the apparatus 100 illustrating the blades 121 of the choke 119 one blade of which is shown in its operatively open attitude. The blades 121 may open independently or may operate in concert.

Referring to Fig. 11, as illustrated the apparatus 100 is operatively associated with a dehydrator 124, like numerals have been used to illustrate like features.

The dehydrator 124 includes a hot air duct 125, a drying tower 126 and an agitator 127.

In this embodiment the tallow extruder 100 is fitted in the horizontal beside the agitator bowl. In this situation a scraper is not required. A single housing 128 is used for the main auger 114 where there is provided a solid pipeshell as the upper hemicylinder 129 and the perforated plate on the lower hemicylinder 130. The product flow is established by gravitation and slides down the product-slide 131 into the agitator 127 whilst the tallow passes through the perforated plate and is extracted through the tallow outlet 118. The extruder is heated by the passage of air through air duct 132. A dividing plate 133 divides the tallow extraction region 134 from the air duct 132.

Referring to Fig. 12 there is illustrated a similar embodiment to that of Fig. 11 except two

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parallel augers 135 and 136 are used one effectively replacing the upper and lower hemicylinders respectively, the upper auger 135 having a solid pipe section housing and functioning purely as a heat exchanger whereas the lower auger 136 is housed in a perforated cylindrical housing for extraction of tallow. The upper pipe section is contained within air duct 132 and is separated from the tallow extraction region 134 again by a dividing plate 133.

10 A geared transmission 137 is provided to couple the augers 135 and 136. Other features are similar to those of Fig. 11 and have been numbered accordingly. Drive for the augers is provided by drive 138.

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CLAIMS

1. A separator for use in separating an input material into at least first and second physically different components, said components being rendered by subjecting said material to heat and pressure, said separator including a conveyor means, said conveyor means being located adjacent a heat exchanger, said heat exchanger providing heat to pressurised material being conveyed, said conveyed material being rendered into said at least two components under the influence of said heat and said pressure, said at least two components being subjected to a selective separator to substantially separate said components.
2. A separator as defined in Claim 1, wherein said conveyor means comprises a screw conveyor and said pressure is generated by providing means resisting material flow along said screw conveyor.
3. A separator as defined in Claim 2 further including a screw conveyor housing, said housing having a heat exchange portion comprising said heat exchanger and a separator portion comprising said selective separator.
4. A separator as defined in Claim 3, wherein said heat exchanger portion comprises at least a portion of a solid pipe and said separator portion comprises at least a portion of a perforated pipe.
5. A separator as defined in Claim 4, wherein said portions are located on opposed hemicylindrical sections of said pipe, said screw conveyor being housed within said pipe.
6. A separator as defined in Claim 4, wherein said solid pipe portion and said perforated pipe portion are disposed in series, said solid pipe portion being disposed intermediate said perforated pipe portion and a material inlet.
7. A separator as defined in Claim 4 further

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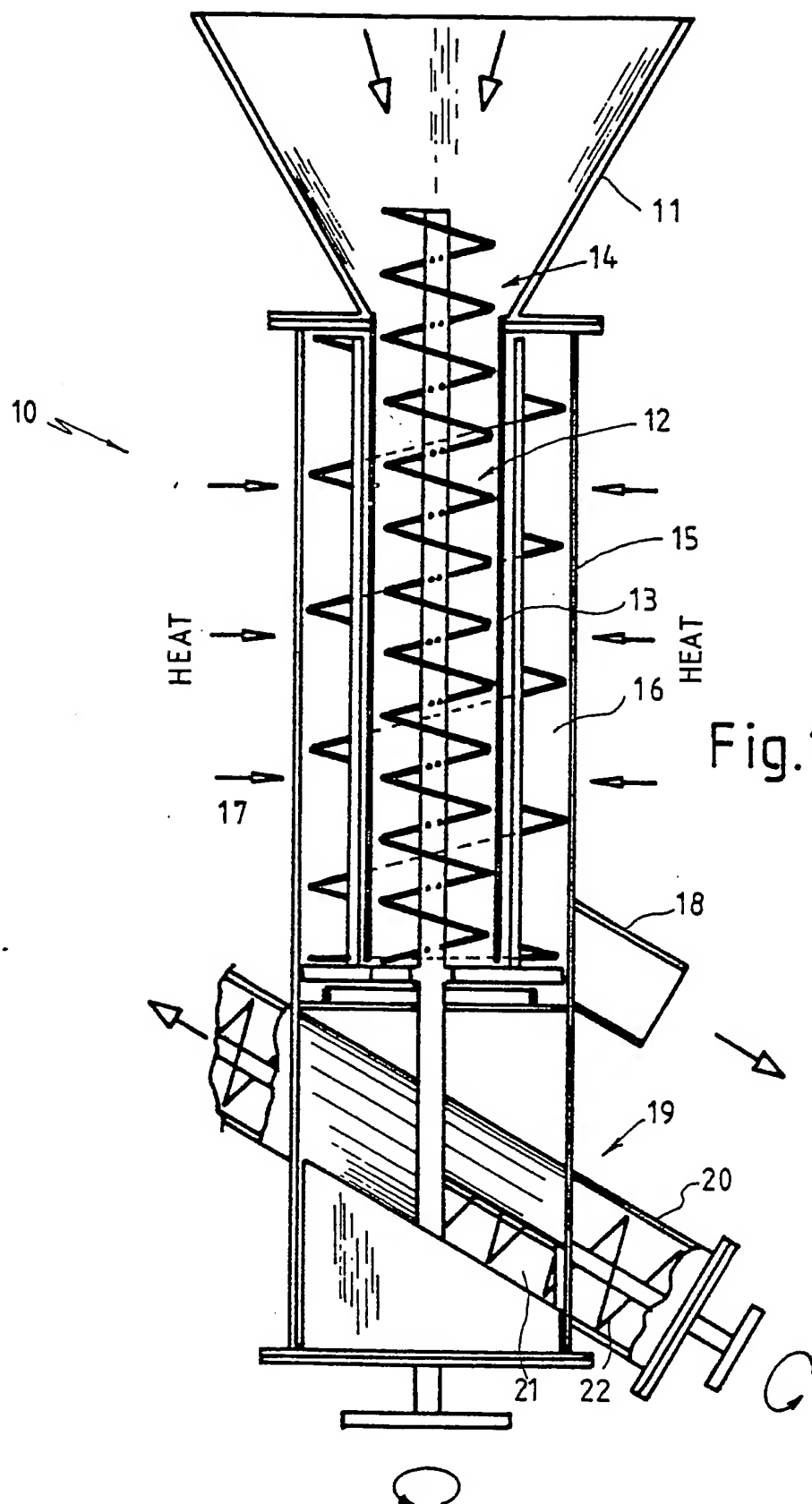
including a scraper, said scraper being adapted to scrape material passing through said perforated pipe.

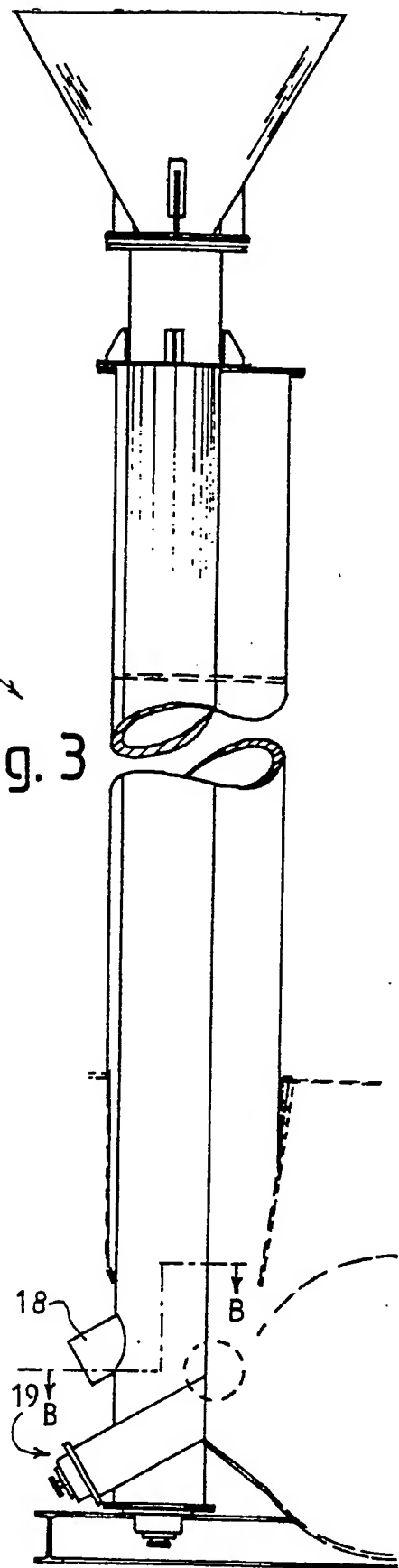
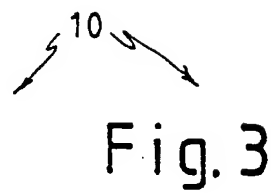
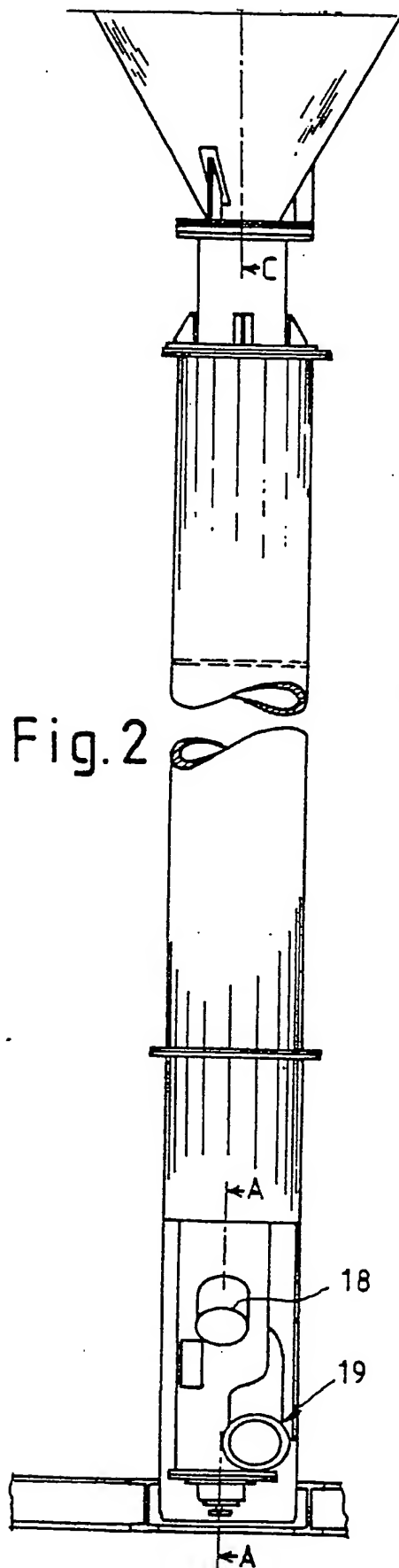
8. A dehydrator including a separator as defined in Claim 1.

9. A dehydrator as defined in Claim 8, wherein said separator is a substantially horizontal separator or a substantially vertical separator.

10. The components of a material separated using the separator defined in Claim 1.

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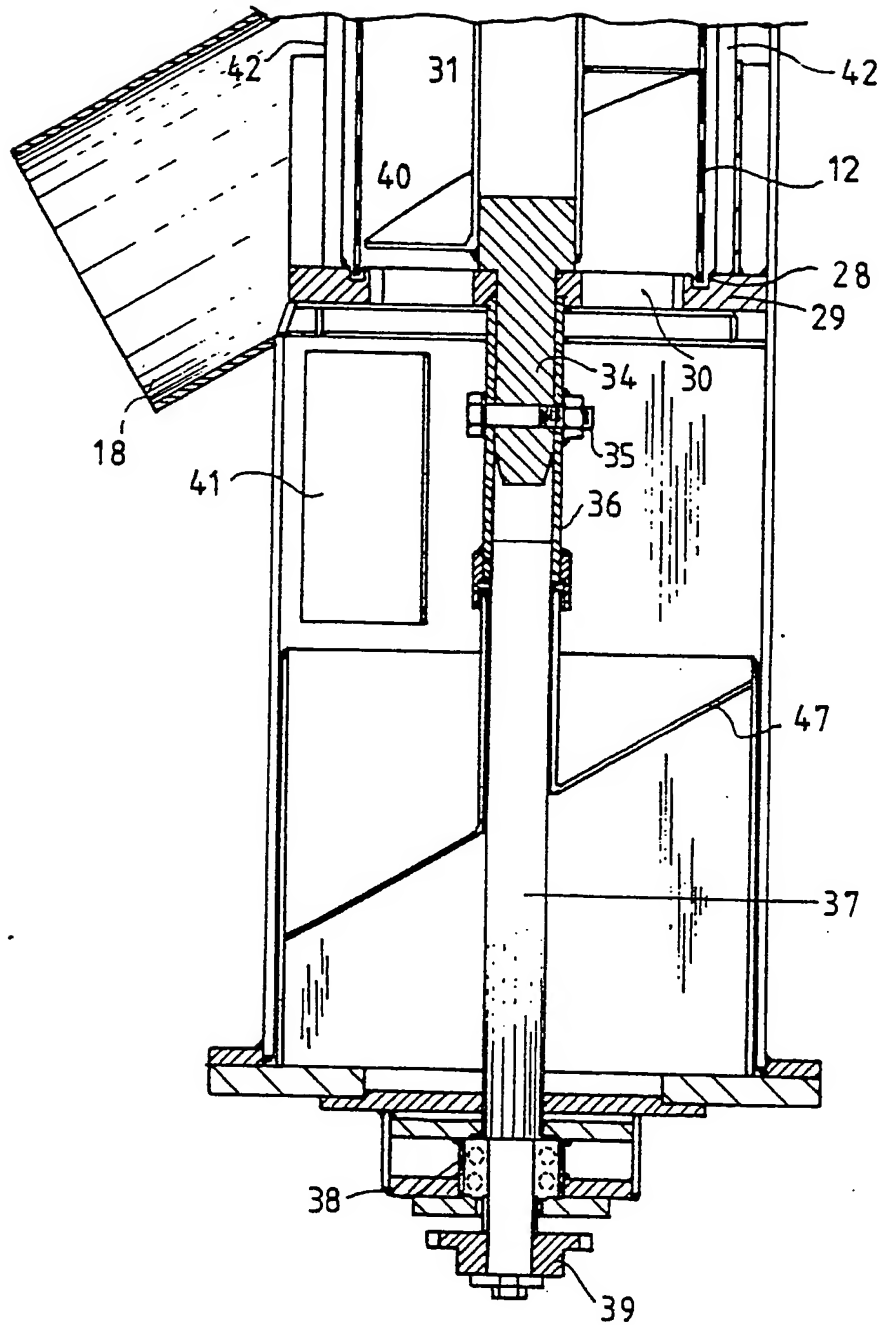


Fig.4

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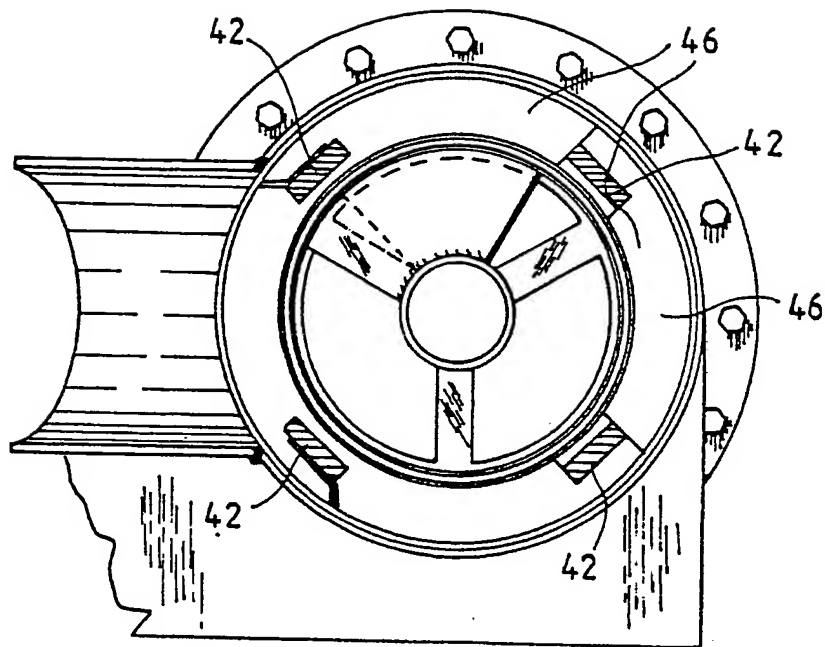


Fig.5

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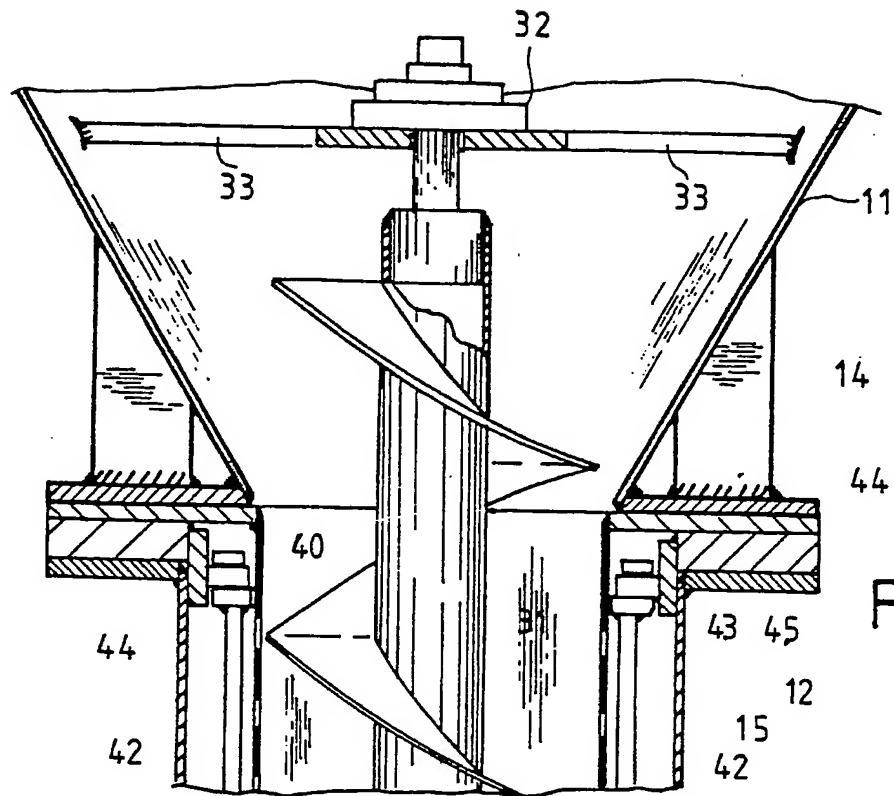


Fig.6

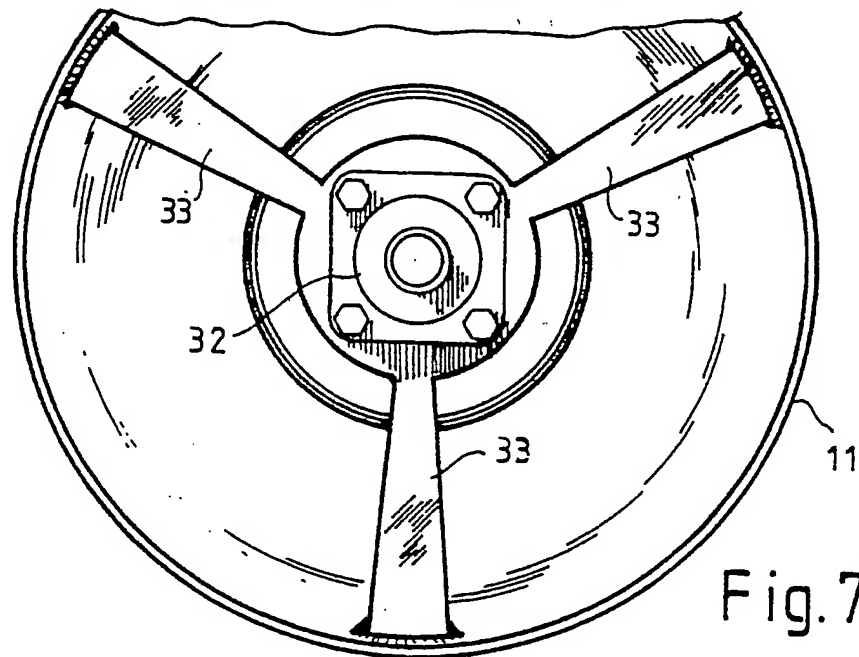


Fig.7

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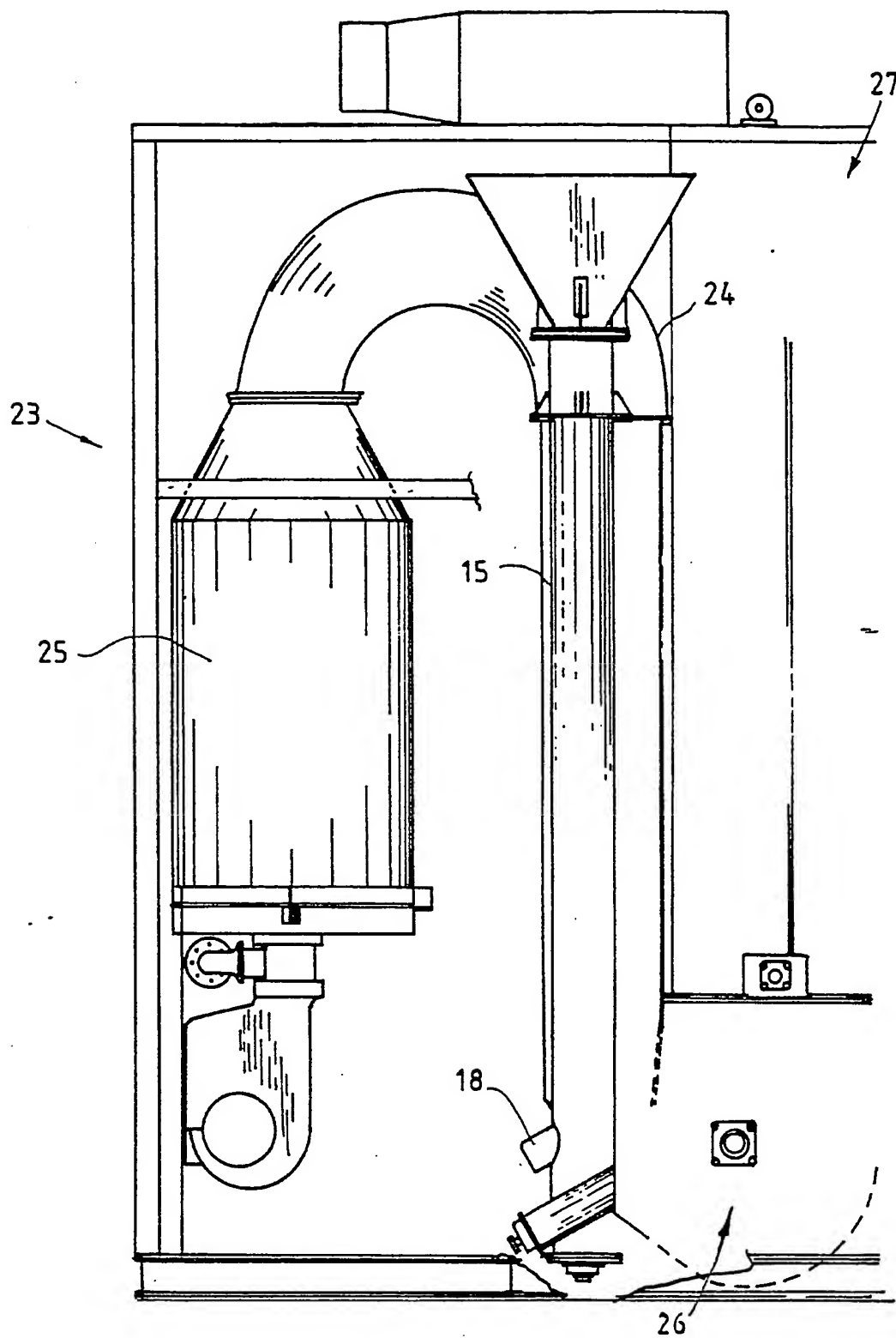


Fig. 8

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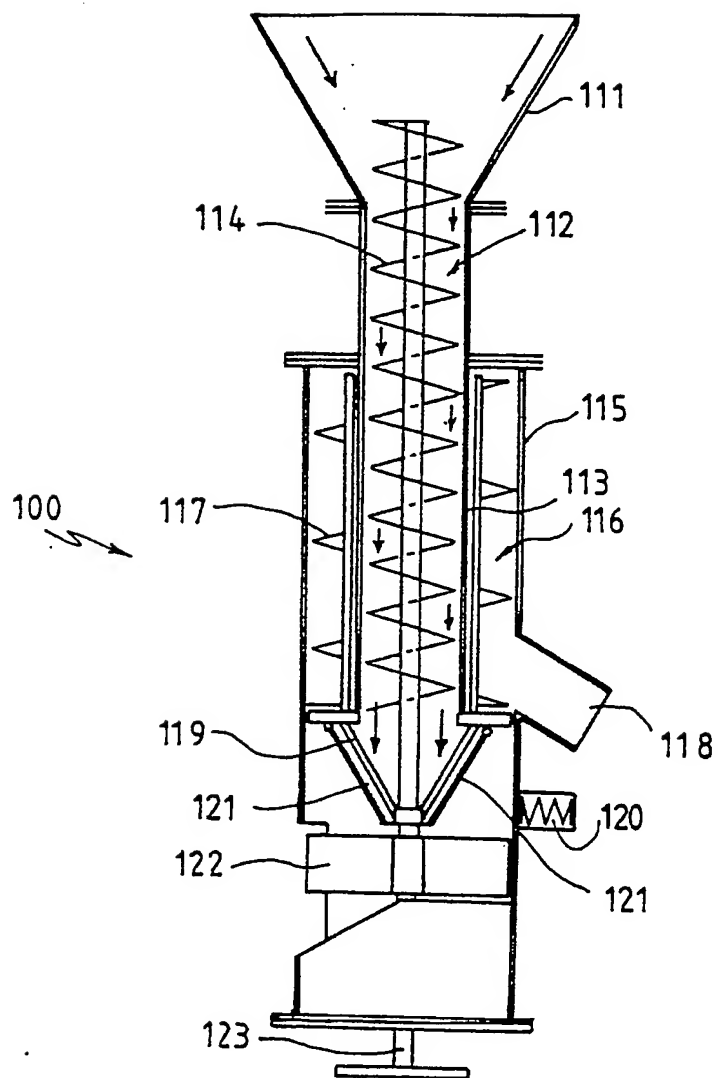


Fig. 9

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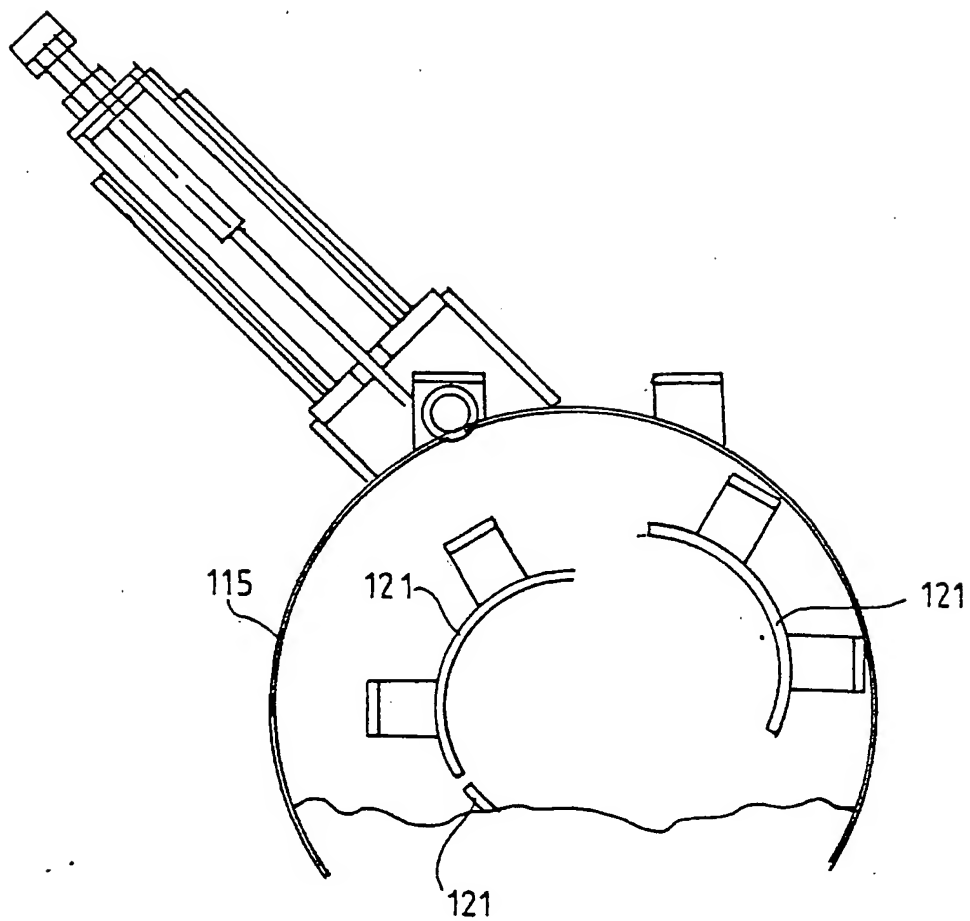
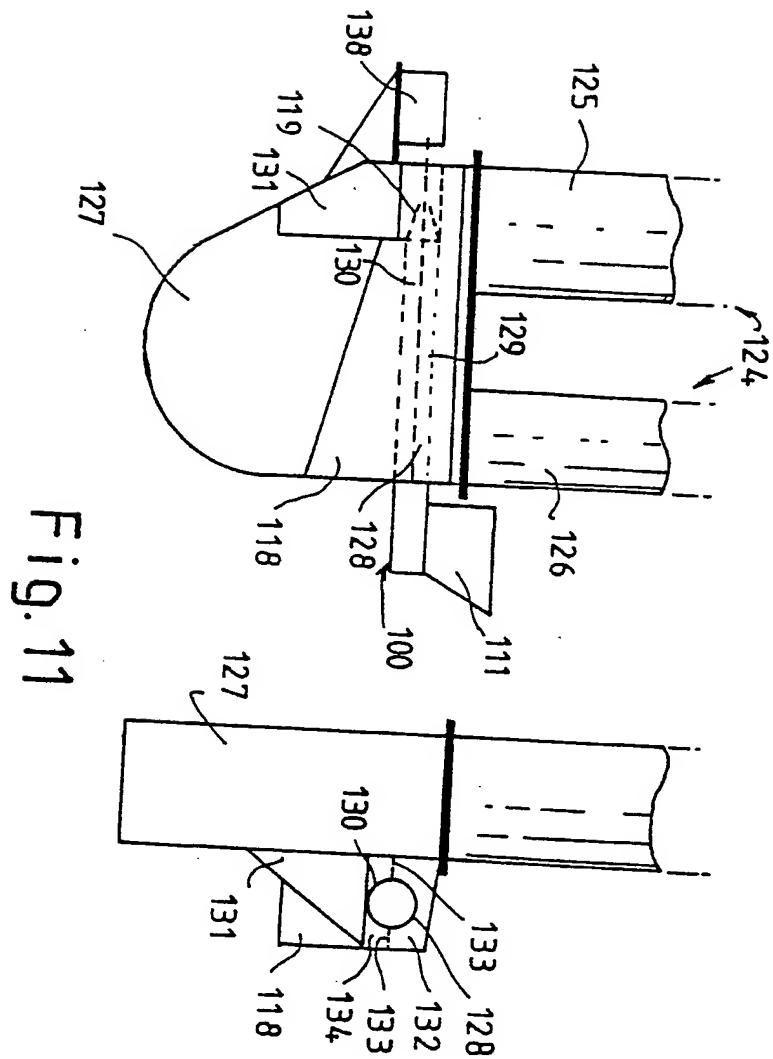


Fig.10

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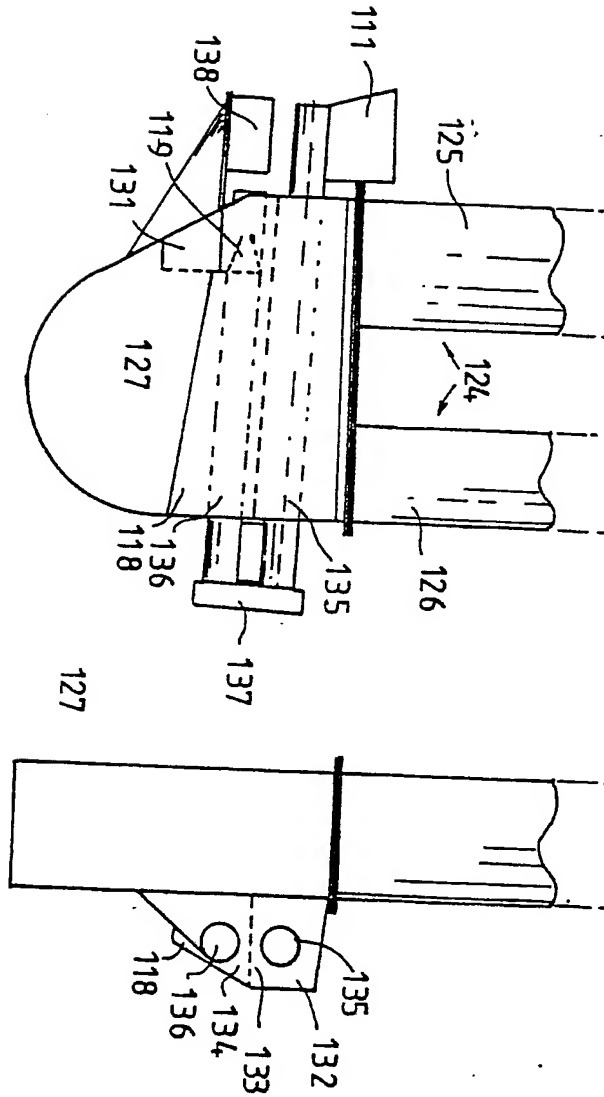


Fig.12

INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 87/00077

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC <div style="text-align: center; font-size: 1.2em;">Int. Cl. ⁴ B30B 9/12, 9/14</div>																										
II. FIELDS SEARCHED <div style="text-align: center; font-size: 0.8em;">Minimum Documentation Searched ⁷</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%; border: none;">Classification System</td> <td style="border: none;">Classification Symbols</td> </tr> <tr> <td style="border: none; text-align: center; padding: 10px 0;">IPC</td> <td style="border: none; text-align: center; padding: 10px 0;">B30B 9/12, 9/14</td> </tr> </table> <div style="text-align: center; font-size: 0.8em; margin-top: 5px;">Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸</div>			Classification System	Classification Symbols	IPC	B30B 9/12, 9/14																				
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IPC	B30B 9/12, 9/14																									
AU : IPC as above; B60B 9/16																										
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; font-size: 0.8em;">Category ¹⁰</th> <th style="width: 60%; font-size: 0.8em;">Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²</th> <th style="width: 30%; font-size: 0.8em;">Relevant to Claim No. ¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">X</td> <td>AU,B, 66849/60 (249852) (WELDING ENGINEERS, INC.) 29 November 1962 (29.11.62)</td> <td style="text-align: center;">1-3:8-10</td> </tr> <tr> <td style="text-align: center;">X</td> <td>AU,A, 84632/75 (USINE DE WECKER) 8 September 1975 (08.09.75)</td> <td style="text-align: center;">1-5:8-10</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US,A, 3092017 (FRENCH) 4 June 1963 (04.06.63)</td> <td style="text-align: center;">1-4:8-10</td> </tr> <tr> <td style="text-align: center;">X</td> <td>US,A, 2551042 (NYROP) 1 May 1951 (01.05.51)</td> <td style="text-align: center;">1-2:8-10</td> </tr> <tr> <td style="text-align: center;">X</td> <td>GB,A, 1163913 (FRENCH OIL MILL MACHINERY CO.) 10 September 1969 (10.09.69)</td> <td style="text-align: center;">1-2:8-10</td> </tr> <tr> <td style="text-align: center;">X</td> <td>GB,A, 2049460 (UOP INC.) 31 December 1980 (31.12.80)</td> <td style="text-align: center;">1-5:8-10</td> </tr> <tr> <td style="text-align: center;">X</td> <td>JP,A, 56-148495 (SANSOU DENKI KK) 17 November 1981 (17.11.81) (JAPATIC English Language Abstract Page 46 Book M114)</td> <td style="text-align: center;">1-5:8-10</td> </tr> </tbody> </table>			Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	X	AU,B, 66849/60 (249852) (WELDING ENGINEERS, INC.) 29 November 1962 (29.11.62)	1-3:8-10	X	AU,A, 84632/75 (USINE DE WECKER) 8 September 1975 (08.09.75)	1-5:8-10	X	US,A, 3092017 (FRENCH) 4 June 1963 (04.06.63)	1-4:8-10	X	US,A, 2551042 (NYROP) 1 May 1951 (01.05.51)	1-2:8-10	X	GB,A, 1163913 (FRENCH OIL MILL MACHINERY CO.) 10 September 1969 (10.09.69)	1-2:8-10	X	GB,A, 2049460 (UOP INC.) 31 December 1980 (31.12.80)	1-5:8-10	X	JP,A, 56-148495 (SANSOU DENKI KK) 17 November 1981 (17.11.81) (JAPATIC English Language Abstract Page 46 Book M114)	1-5:8-10
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<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁴ Special categories of cited documents: ¹⁵</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"Z" document member of the same patent family</p> </div> </div>																										
IV. CERTIFICATION <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.1em;">19 May 1987 (19.05.87)</div> </td> <td style="width: 50%; border: none;"> Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.1em;">(26.05.87) 26 MAY 1987</div> </td> </tr> <tr> <td style="width: 50%; border: none;"> International Searching Authority <div style="text-align: center; font-size: 1.1em;">Australian Patent Office</div> </td> <td style="width: 50%; border: none;"> Signature of Authorized Officer <div style="text-align: center;"> B. MURRAY </div> </td> </tr> </table>			Date of the Actual Completion of the International Search <div style="text-align: center; font-size: 1.1em;">19 May 1987 (19.05.87)</div>	Date of Mailing of this International Search Report <div style="text-align: center; font-size: 1.1em;">(26.05.87) 26 MAY 1987</div>	International Searching Authority <div style="text-align: center; font-size: 1.1em;">Australian Patent Office</div>	Signature of Authorized Officer <div style="text-align: center;"> B. MURRAY </div>																				
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ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 87/00077

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members					
<hr/>							
AU	84632/75	BE	831249	DE	2559405	FR	2310867
		GB	1507946	IT	1041814	JP	51134977
		LU	72485	NL	7407751		
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GB	1163913	NL	6611808				
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GB	2049460	DE	3009710	JP	55127200		
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END OF ANNEX